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THIS DOCUMENT CONTAINS PROPRIETARY DATA

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
SPECIFICATION

LOW ALTITUDE ALERTING SYSTEM

1. SCOPE

1.1 Scope. This specification sets forth the requirements for modification kits for the AN/TPX-42A(V) and associated radar display equipments, Indicator Group OD-69T, Numerics Generation Conversion Equipment (NGCE) FA-8953, Bright Radar Indicator Tower Equipment (BRITE), Types FA-7847, FA-8178, FA-8959, and Indicator Groups OD-56, OD-57, OD-58/T, OD-129/T and IP-1085 that will incorporate the Low Altitude Alerting System (LAAS) into this equipment to give the system the capability of alerting the Air Traffic Controller, on a code selective basis, when aircraft uuder his control descend below minimum altitudes.

1.2 Classification. Nine types, twelve sizes, and three classes of modification kits are covered by this specification.

1.2.1 Type. The following types of modification kits are covered by this specification.

Type I Modification Kit for AN/TPX-42A(V)4 system with Interrogator Group OX-17/T, Indicator Control C-8625/T, Interrogator Control C-8626/T, and Indicator Group OD-69/T.

Type II Modification Kit for AN/TPX-42(V)4 system with Interrogator Group OX-17/T, Indicator Control C-8625/T, Interrogator Control C-8626/T, Numerics Generation Conversion, Equipment (NGCE) FA-8953, Bright Radar Indicator Tower Equipment (BRITE), Types FA-7847, FA-8178, FA-8959.

Type III Modification kit for AN/TPX-42A(V)3 system with Interrogator Group OX-17/T, Indicator Control C-8625/T, Interrogator Control C-9684/T, and Indicator Group OD-58/T or OD-69/T.

Type IV Modification kit for AN/TPX-42A(V)2 system with Interrogator Group OX-13/T, Indicator Control C-8625/T, Interrogator Control C-9684/T, and Indicator Group OD-56/T and OD-57/T.

Type V Modification kit for AN/TPX-42A(V)1 system with Interrogator Group OX-13/T, Indicator Control C-8625/T, Interrogator Control C-9684/T, and Indicator Group OD-57/T.

Type VI Modification kit for AN/TPX-42A(V)1 system with Interrogator Group OX-13/T, Indicator control C-8625/T, Interrogator Control C-9684/T, and Indicator Group OD-129/T and OD-57/T.

Type VII Modification kit for AN/TPX-42A(V)7 systems with Interrogator Group OX-17/T, Indicator Control C-8625/T, Interrogator Control C-9684/T, and Indicator Group IP-1085/T.

Type VIII Modification kit for AN/TPX-42A(V)5 system with Interrogator Group OX-17/T, Indicator Control C-8625/T, Interrogator Control C-8626/T and Indicator Group OD-58/T.

Type IX Modification kit for AN/TPX-42A(V)5 system with Interrogator Group OX-21/T, Indicator Control C-8625/T, Interrogator Control C-8626/T, and Indicator Group OD-57/T.

1.2.2. Size. The following equipment position capacities are covered by this specification.

Size A	1 position	Size H	9 position
Size B	3 position	Size I	10 position
Size C	4 position	Size J	12 position
Size D	5 position	Size K	14 position
Size E	6 position	Size L	18 position
Size F	7 position		
Size G	8 position		

1.2.3 Class. Modification kits of the following classes are covered by this specification.

Class 1	for PPI Indicator and one BRITE/ Numeric equipment positions.
Class 2	for PPI Indicator positions.
Class 3	for BRITE/Numeric equipment positions.

2. APPLICABLE DOCUMENTS

2.1 FAA documents. The following FAA specifications and standards, of the issues in effect on the date of the invitation for bids or request for proposals, form a part of this specification.

2.1.1 FAA specification.

FAA-D-2494/1/2	Instruction Books Manuscripts Technical Equipment and Systems, Requirements
FAA-G-2100/1	Electronic Equipment, General Requirements; Part 1, Basic Requirements for all Equipments
FAA-G-2100/3	Part 3, Requirements for Equipments Employing Semiconductor Devices
FAA-G-2100/4	Part 4, Requirements for Equipments Employing Printed Wiring Techniques
FAA-G-2100/5	Part 5, Requirements for Equipments Employing Microelectronic Devices
FAA-E-2482	Numeric Generation Conversion Equipment, TPX-42 BRITE Interface

2.1.2 FAA standards.

FAA-STD-013	Quality Control Program Requirements
ORDER 1010.51A	U.S. National Standard for IFF Mark X (SIF) Air Traffic Control Radar Beacon System (ATCRBS) Characteristics

(Copies of these specifications, standards, and other applicable FAA documents may be obtained from Federal Aviation Administration Washington, D.C. 20591, ATTN: Contracting Officer. Request should fully identify material desired, i.e., specification and amendment numbers and dates. Request should cite the Invitation for Bids, Requests for Proposals, or the contract involved, or other use to be made of the requested material.)

2.2 FAA and Military Technical Manuals. The following FAA and Military technical manuals, of the issues in effect on the date of the invitation for bids or request for proposals, form a part of this specification.

a. Interrogator Set AN/TPX-42A(V) 1, 2, 3, 5, 7; T.O. 31P4-2TPX42-2, -3, -4, and 6WC-1.

b. Indicator Group OD-58/T; T.O. 31P4-2T-12, -13, and -14.

c. Video Signal Processor CP-1045/T; T.O. 31P4-2T-32, -33 and -34.

d. Indicator Data Processor CP-1047/T; T.O. 31P4-2T-42, -43, and -44.

e. Signal Processor CN-1358/T; T.O. 31P4-2T-52 and -54.

f. Analog to Digital Converter CV-2792/T; T.O. 31P4-2T-62 and -64.

g. Indicator Control C-8625/T; T.O. 31P4-2T-72 and -74

h. Interrogator Set Control C-8626/T; C-9684/T; T.O. 31P4-2T-82 and -84

i. AN/FPN-47-OD-69/T Indicator Group; T.O. 31P5-2FPN47-12-3, -13-2, -14-2, -16WC-1-3, and -19-2.

j. Numeric Generator and Conversion Equipment, FA-8953

k. T.O. 31P5-2FPN47-511, Installation of Interrogator Set, AN/TPX-42A(V)3 and Associated Indicator Modification.

l. Indicator Group OD-56/T, OD-57/T; T.O. 31P4-2T-2, -3, -4.

m. Bright Radar Indicator Tower Equipment, Types FA-7847, FA-8178, FA-8959.

(The above technical manuals are on file for reference purposes in the FAA Library Services Division, Room 930, 800 Independence Ave., S.W., Washington, D.C.)

2.3 Military publications. The following military specifications and standards, of the issues in effect on the date of the invitation for bids or request for proposals, form a part of this specification.

2.3.1 Military specification.

MIL-T-9941	Technical Manuals; Ground C-E-Equipment, Facility, Site and System, Preparation of

MIL-E-4158D	Electronic Equipment, Ground; General Requirements For
MIL-I-461	Electromagnetic Interference Characteristics Requirements for Equipment.
DOD AIMS: 657; 70-527-1, -3, -4 -5, -7, -8, -10, -11, -12, -13	Interrogator Set, AN/TPX-42A(V)
MIL-M-38784	Military Specification Manuals, Technical: General Style and Format Requirements.

2.3.2 Military standard.

MIL-STD-454	Standard General Requirements for Electronic Equipment
MIL-STD-470	Maintainability Program Requirements
MIL-STD-736	Military Standard Unitized Equipment Design
MIL-STD-471	Maintainability Demonstration
MIL-STD-756	Military Standard Reliability Prediction
MIL-STD-781	Reliability Tests
MIL-STD-785	Requirements for Reliability Programs
MIL-STD-801B	Environmental Test Methods for Aerospace and Ground Equipment
USAS Y32.16-1968	Electrical and Electronic Reference Designations

2.4 Other publications. The following publications, and revisions and amendments thereto, form a part of this specification.

MIL-HDBK-217	Reliability, Stress and Failure Rate Data for Electronic Equipment
MIL-HDBK-472	Maintainability Predictions
GSA Document	GSA Stock Catalog IL/Part 1

(Single copies of Military specifications, standards, and other publications may be requested by mail or telephone from U.S. Naval Supply Depot, 5701 Tabor Ave., Philadelphia, Pennsylvania 19120. Copies of the GSA document may be obtained from the Superintendent of documents, U.S. Government Printing Office, Washington, D.C. 20402.)

3. REQUIREMENTS

3.1 Equipment to be furnished by the contractor.

3.1.1 Equipment. The modification kits shall be all inclusive and shall contain all units, subchassis, modules or printed circuit assemblies, wiring harnesses, individual wires and cable, components, clamps, grommets, installation hardware, templates for mounting holes, decals, and rubber stamps, capable of using paint as the stamp fluid (if required for chassis or circuit board marking), and any other material deemed by the contractor as necessary to meet the requirements of the specification. Each modification kit furnished by the contractor shall be complete in accordance with all specification requirements and shall include the major items tabulated below. Any feature or item necessary for proper operation with the requirements of this specification shall be incorporated even though that feature or item may not be specifically described herein.

a. LAAS Circuit Card Assemblies, for Indicator Data Processor (IDP) CP-1047/T, 3 each.

   (1) Spare LAAS Circuit Card Assemblies, 3 each.

b. Alarm Generation Circuit Card Assembly, for OD-56/T, OD-57/T, OD-58A/T, OD-69/T, OD-129/T, and IP-1085/T Indicators and for FA-8953 Numeric Generation Conversion Equipment, variable quantity.

c. Numeric Generation Conversion Equipment, FA-8953; Modified Circuit Card Assembly, A1A1, and instructions for modifying equipment back plane wiring; for Alarm Generator, variable quantity.

d. Alarm Unit with Visual (Lamp) and Audible (Buzzer); for Numeric Generation Conversion Equipment, FA-8953, and for Indicator Groups OD-56/T, OD-57/T, OD-58/T, OD-69/T, OD-129/T, IP-1085/T; variable quantity.

3.1.2 Data and documentation. The data and documentation for the modification of the AN/TPX-42A(V) and associated display equipments, which incorporates the LAAS into these equipments, shall be supplied with each Type of modification kit (par. 1.2.1) as required in the following paragraphs. The submission and acceptance of any data and documentation shall not be construed as modifying any other requirements of the specification.

3.1.2.1 Instruction books. Instruction books shall be furnished in accordance with FAA-D-2494/1, Part I, and FAA-D-2494/2, Part II, and as specified in the contract schedule. Installation instructions shall be arranged to facilitate installation of the modification kits as specified herein. In addition to complying with paragraph

3.32 of FAA-D-2494/1, Section 9 of the instruction books shall include step-by-step installation instructions, wire routing diagrams, exact location of added components, and instructions for removal of components deleted by the modification kits as specified herein.

3.1.2.2 Technical manuals. Instruction books, technical orders, and drawings, which are affected or changed as a result of the modification of the equipment to incorporate the LAAS, shall be updated and shall be provided as part of the modification kit instruction book as change pages to the basic technical manuals. The change pages shall be in accordance with MIL-T-M-38730. The change pages shall be provided for all sections of the technical manuals affected including operation, performance testing, certification, fault isolation, installation, circuit diagrams, parts, and work cards.

3.1.2.3 Engineering data. The basic engineering data in the Government inventory under functional Categories B, E, F, G, H, and I (AFSCM/AFLCM 310-1) shall be updated to include the changes resulting from the modification of the equipment to incorporate the LAAS. The changes shall be made to all of the basic engineering data affected including data for reprocurement of spares and repair parts, for reprocurement of items of supply, for Government manufacturing and maintenance engineering, for interface control, and for facility installations.

3.1.3 Special tools. All hand tools which are necessary for the installation of the modification kits and for the field maintenance of the modified equipments incorporating the LAAS shall be itemized in the instruction book and in the technical manual revisions or changes. Those necessary tools which are not listed under FSG-51, Hand Tools, or FSG-52, Measuring Tools, in the GSA Stock Catalog IL/Part 1 shall be supplied by the contractor with each equipment.

3.1.4 Test equipment list. All test equipment that is required for field maintenance of the modified equipments incorporating the LAAS shall be itemized. The itemized list shall be submitted to the Contracting Officer.

3.2 Definitions.

3.2.1 Acronyms and abbreviations.

(a)	LAAS	Low Altitude Alerting System
(b)	IDP	Indicator Data Processor CP-1047/T
(c)	VSP	Video Signal Processor CP-1045/T
(d)	TTL	Transistor-Transistor Logic having the following characteristics

(1) Logic "0" OV - 0.8V
(2) Logic "1" 2.4V - 5V
(3) Rise Time 0.1 microsecond maximum
(4) Fall Time 0.1 microsecond maximum

(e) ACP Azimuth Change Pulse
(f) NM Nautical Mile
(g) PPI Plan Position Indicator
(h) BCD Binary Coded Decimal
(i) BRITE/Numerics Radar display system comprised of Brite Radar Indicator Tower Equipment and Numeric Generation Conversion Equipment.

3.2.2 Service Conditions. The service conditions shall be those of paragraph 3.1.2.4, Environmental, of specification DOD AIMS 70-527-5, for Indicator Data Processor CP-1047/T, CEI No. 373432A.

3.2.3 Pulse Parameters. The pulse parameters shall be those of FAA-G-2100/1, paragraphs 1-3.2.14 through 1-3.3.2.17, and of Order 1010.51A, paragraph 2.

3.3 General Requirements. The modification kit shall modify the existing OX-13/T, OX-17/T and OX-21/T Interrogator Groups and associated display equipment to be configured and operated as follows:

a. New printed circuit board (PCB) assemblies or data storage and comparator modules (par. 3.4) and any required back plan wiring shall be installed in the Indicator Data Processor (IDP). These new PCB assemblies shall receive range, azimuth, identity code and altitude data and control signals as inputs from the IDP as specified in paragraph 3.4 and subparagraphs. The minimum altitude and identity code lock-out data shall be stored in a solid state memory as specified in paragraph 3.4. The LAAS cards shall compare the corrected altitude with the minimum altitude for the reported range and azimuth as defined by the tailored LAAS map made for a particular site and shall compare the reported identity code with the identity codes in the code lock-out memory. If the corrected altitude is less than or equal to the minimum altitude and the identity code is not locked out, the LAAS card shall generate a logic one and add it to the altitude word, as bit XY15, as it is loaded into the display buffer in the IDP. The circuit shall be designed to permit normal operation of the basic system with the PCB assemblies removed. As an option to the user, the LAAS modification kit shall enable the altitude converter within the IDP to apply the local altimeter correction to all reported altitudes regardless of the preset flight level or transition altitude strapping within the IDP. This option shall apply only to the LAAS circuitry and shall not affect the corrected altitude passed to the display as part of the target message.

b. The modification kit shall enable the PPI unit (par. 3.5) to receive and process the LAAS information contained in bit 15 of the Altitude word. When a reported identity code matches the selected identity code(s) or when the all aircraft position function is selected on the Indicator Control C-8625/T and if bit 15 is set, that PPI unit shall display a flashing target format for that target report and shall activate the visual (flashing lamp) and audible (horn or buzzer) alarms for that PPI unit by way of the separate alarm drive circuitry provided for the LAAS functions. The modification shall provide adequate level of visibility for the flashing lamp alarm in the typical light conditions of the ATCT cab.

c. The modification kit shall enable the BRITE/Numeric equipment (par. 3.6) to receive and process the LAAS information contained in bit 15 of the Altitude word in the same manner as the PPI unit in paragraph 3.3b. The modification kit shall provide new circuit cards to replace the existing circuit cards or shall modify the existing circuit cards currently in the BRITE/ Numeric equipment which require modification to provide the LAAS function. Any modification to BRITE/ Numerics circuit card assemblies shall be accomplished on the latest revision of the circuit card assemblies existing at the time of contract award. An alarm unit, containing the visual and audible alarms, separate from the Indicator Control C-8625/T, shall be provided with the modification kit for each BRITE/ Numeric equipment. The modification kit shall provide adequate level of visibility for the flashing lamp alarm in the variable typical light conditions of the ATCT cab.

d. The modification kit shall be designed such that a failure of the LAAS will not result in any degradation of the current system operating parameters. The LAAS modification kit failure shall cause the system to revert back to pre-LAAS modification operation. All LAAS alarms shall be inhibited upon detection of failure in the LAAS modification kit.

e. The modification shall enable the Indicator Control C-8625/T to control the LAAS functions, visual (flashing lamp), audible (horn or buzzer) and flashing target format alarms, for its associated display equipment by selection of the identity code or of the all aircraft position. When the low altitude alert is first detected, the audible alarm shall alarm for 2 seconds and shall remain silent thereafter until the display equipment is clear of all low altitude alarms for at least one second. The low altitude alert lamp shall be labeled "LOW ALT" and shall continue to flash for each detected low altitude alert. The alarm unit, containing the audible and visual alarms, shall be capable of being surface mounted in the display canopy or console or attached to the Indicator Control C-8625/T.

f. The LAAS modification kit shall contain provision for monitoring a test target as generated by the Video Signal Processor (VSP). This test target shall be processed and checked by the PCB assemblies in a manner which will test the operational status of all circuitry in the LAAS modification kit. Failure of this on-line test target check shall result in steady illumination of the low altitude alert lamp at all operating positions.

g. The LAAS modification kit shall contain provision for verifying the contents of the range, azimuth and altitude memories. This test shall be accomplished by causing range and azimuth counters, contained within the PCB assemblies, to cycle through all memory addresses in synchronism with the sweep and antenna rotation of the on-site radar. The altitude stored in the LAAS memories shall be compared to the setting of thumbwheel switches (provided as part of the modification kit) and a video signal, suitable for display on a PPI unit and a BRITE/Numeric system, shall be generated for each memory address which is equal to the switch setting. The video pattern thus displayed shall indicate the geographical coverage of altitude alerts at the switch selected altitude.

The video signal shall be compatible with the video inputs of any of the Indicator Groups and BRITE/Numeric equipment listed in paragraph 1.2.1. The performance of this verification test shall not affect normal basic system operation other than to disable normal LAAS alarm generation. This test condition shall cause the visual alert lamp at each operating position to illuminate in a steady, non-flashing mode to indicate that the LAAS system is not in normal operation.

3.3.1 Solid-State devices. The contractor shall use solid-state circuitry in the modification kit design and shall not use vacuum tube circuitry or relays without the written permission of the contracting officer. Maximum usage shall be made of microelectronic integrated circuits as determined by design requirements. Semiconductor selection criteria shall be in accordance with FAA-G-2100/3 and FAA-G-2100/5.

3.3.2 Modular and common contruction. Plug-in solid-state modules or printed circuit cards assemblies shall be used to the maximum extent practicable. Modules and card assemblies shall be designed to permit maximum interchangeability to limit the numbers of different types of components to simplify spare parts inventory management. All modules and card assemblies shall be provided with test points and a ground stud for external ground connection and shall require no unsoldering or removal of wires in order to remove the modules of card assemblies. The electrical connections on the modules or card assemblies shall be male connectors. Modules and card assemblies shall be securely locked in position when in place. The circuits shall be designed to permit normal operation of the basic system with the modules or printed circuit card assemblies removed.

3.3.3 Reversibility. The plug-in modules or printed circuit card assemblies shall incorporate features which prevent installing the module or printed circuit card assemblies incorrectly either mechanically or electrically.

3.3.4 Use of sockets. All solid-state programmable read only memories (PROM) shall be mounted on the printed circuit card assemblies by using sockets which permit a quick replacement when necessary.

3.3.5 Workmanship. The modification kit shall be contructed and finished using the methods specified in FAA-G-2100/1 and FAA-G-2100/4. Any deviations from the mechanical or electrical standards specified in FAA-G-2100/1 and FAA-G-2100/4, except as stated herein, must have the approval of the contracting officer.

3.4 Data Storage and Comparator Modules. The data storage and comparator modules or printed circuit card assemblies shall be capable of storing and checking 1024 programmed range and azimuth sectors of altitude data within the coverage area of the AN/TPX-42A(V) system. Each sector shall consist of a specific altitude for a certain range and azimuth boundary. The range, azimuth, and minimum altitude data shall be permanently stored in programmable read only memory (PROM) devices, which are a part of the printed circuit card assemblies. The PROM shall provide an azimuth resolution of 8 ACP's or approximately 0.703^{o} for a maximum coverage of 360^{o} and a range resolution of 1/8 NM for a maximum range of 63-7/8 NM. The mode 3A code lock-out PROM shall be capable of storing a maximum of 1024 identity codes.

3.4.1 Data Module Input Output Signals. The LAAS data storage and comparator modules or printed circuit card assemblies shall accept the following data inputs from the system.

a. Azimuth data - nine inputs
b. Range data-eleven inputs
c. Altitude data, corrected input to comparator - twelve inputs
d. Mode 3A identity code - ten inputs
e. COMPUTE XY - one input,
f. $\overline{\text{ID2 STROBE}}$ - one input
g. XY15 - one input
h. Clock pulse, 1/32 nM - one input
i. Radar Pre-trigger
j. ACP data
k. ARP data
l. Altitude test data from thumbwheel switches
m. TEST/$\overline{\text{NORM}}$
n. Test target bit

The modules or assemblies shall process the target data and shall develop the minimum altitude of the target at the input range and azimuth. The modules or assemblies shall compare this minimum altitude to the target's corrected altitude at the output of the altitude converter and shall produce a logic bit when the altitude converter output is equal to or less than the programmed minimum altitude, provided that the Mode 3A code for that target has not been locked-out. The modules or printed circuit card assemblies shall accept the NEG ALT, ALT ENABLE, Mode C Valid and bit 15 line (XY 15) data inputs of the target in the system to load the logic bit produced into the altitude word as bit 15 for detection by the display circuitry to generate the necessary alerting signals. The modules shall also accept, as test inputs, altitude data from the thumbwheel switches. Two test video signals shall also be generated as outputs: TEST CHECK video for continuous on line test of LAAS circuitry and TEST VIDEO for off line testing of the circuitry.

3.4.1.1 Input data format and characteristics. The LAAS data storage and comparator modules or printed circuit card assemblies shall accept the following input data from the Indicator Data Processor with the format and characteristics indicated.

a. Azimuth data

Format: 9 bit parallel (binary)

θ12	θ11	θ10	θ9	θ8	θ7	θ6	θ5	θ4
180°	90°	45°	22.5°	11.25°	5.625°	2.8125°	1.4062°	0.7031°

Timing: available during COMPUTE XY.
Characteristics: TTL

b. Range data

Format: 11 bits parallel (binary)

R12	R11	R10	R9	R8	R7	R6	R5	R4	R3	R2
128NM	64NM	32NM	16NM	8NM	4NM	2NM	1NM	½NM	¼NM	1/8NM

Timing: available during COMPUTE XY.
Characteristics: TTL

c. Altitude data (corrected, to comparator)

Format: 12 bits parallel (BCD)

12(MSB)	11	10	9	8	7	6	5	4	3	2	1(LSB)
80kft.	40kft.	20kft.	10kft.	8kft.	4kft.	2kft.	1kft.	800ft.	400ft.	200ft.	100ft.

Timing: available during COMPUTE XY.
Characteristics: TTL

d. Mode 3/A identity code data

Format: 10 bits parallel (Octal)

1	2	3	4	5	6	7	8	9	10
A4	A2	A1	B4	B2	B1	C4	C2	C1	D4

Timing: available during ID2 STROBE.
Characteristics: TTL

e. COMPUTE XY

COMPUTE XY will be available as soon as the range and azimuth words have been assembled in the input shift register. Logic "1" for range and azimuth word or logic "0" otherwise.

Characteristics: TTL

f. $\overline{\text{ID2}}$ $\overline{\text{STROBE}}$

Format: 1 bit

Logic "0" when Mode 3A word is present on logic "1" otherwise.

Characteristics: TTL

g. XY15

Format: 1 bit

Logic "0" during altitude word.

Characteristics: TTL

h. Clock pulse.

Frequency: 0.5178 mHz.

Duration: square wave

Characteristics: TTL

i. Radar Pretrigger

Duration: 1 usec nominal

Repetition Rate: site dependent

Characteristics: TTL

j. ACP

Duration: 25-75 usec

Repetition Rate: 4096 pulses per antenna revolution.

Characteristics: TTL

k. ARP

Duration: 25 - 75 usec

Repetition Rate: one per antenna revolution

Characteristics: TTL

l. Altitude Test data

Format: 12 bits parallel (BCD)

12(MSB)	11	10	9	8	7	6
80kft.	40kft.	20kft.	10kft.	8kft.	4kft.	2kft.

5	4	3	2	1(LSB)
1kft.	800ft	400ft	200ft	100ft.

Timing: available during COMPUTE XY.

Characteristics: TTL

m. $\overline{\text{TEST}}/\text{NORM}$

Format: 1 bit binary

Logic "1" for test or logic "0" for normal operation.

Characteristics: TTL

n. Test target

Format: 1 bit binary

Logic "1" when on the line test target is present or logic "0" otherwise.

Timing: available during COMPUTE XY.

Characteristics: TTL

o. $\overline{\text{NEG}}$ $\overline{\text{ALT}}$

Format: 1 bit

Logic "1" for positive altitude or
Logic "0" otherwise.

Characteristics: TTL

p. ALT ENABLE

Format: 1 bit

Logic "1" when BCD altitude data is ready or Logic "0" otherwise.

Characteristics: TTL

q. Mode C valid

Format: 1 bit

Logic "1" for valid Mode C codes or
Logic "0" otherwise

3.4.1.2 Output data format and characteristics. The LAAS data storage and comparator modules or printed circuit card assemblies shall deliver the following outputs.

a. XY 15M

Format: 1 bit

Logic "1" for low altitude alarm during altitude word or Logic "0" otherwise during altitude word.

Characteristics: TTL

b. Test video

Format: 1 bit

Logic "1" when in test mode and altitude data from thumbwheel switches is equal to and less than the minimum altitude contained in altitude PROM.
Logic "0" otherwise.

Characteristics: TTL

c. Test check

Format: 1 bit

Logic "1" when on line test target meets a preset minimum altitude test in the altitude PROM. Logic "0" when on line test target fails a preset minimum altitude test in the altitude PROM.

Characteristics: TTL

3.4.2 Programmable Read Only Memory devices. The programmable read only memory devices (PROM) shall have a capacity of 512 words, 8 bits per word for checking programmed sectors of range and azimuth coverage and 1024 words, 4-bits per word for checking programmed sectors of altitude. The range and azimuth PROM shall have eleven and nine address lines, respectively, and eight output lines. The altitude PROM shall each have ten address lines and four output lines. The 512X8 memories shall give an azimuth resolution of 0.703°, a range resolution of 1/8NM for a maximum range of 63-7/8 NM and 1024 range-azimuth sectors. The 1024X4 memories shall give 1024 separate altitude sectors (32 range X 32 azimuth). The mode 3A identity code lock-out PROM shall have the capacity of storing 1024 discrete codes. All PROMs provided with the modification kit for a facility shall be programmed by the contractor in accordance with the minimum altitude data and code lock-out data as provided by the Government for that facility. The contractor shall provide unprogrammed PROMS when data is not available. The contractor shall provide the guidelines as to the general format of the minimum altitude data to be provided by the Government for a designated facility. The PROM shall be mounted on the module or printed circuit card assembly using sockets to permit a quick replacement when necessary.

3.5 PPI Unit.

The PPI unit shall receive the LAAS information contained in bit 15 of the Altitude word transmitted from the IDP and shall process this LAAS information to provide the LAAS functions, consisting of the flashing target format, visual (flashing lamp) and audible (horn or buzzer) alarms. The modification to the PPI unit shall consist of adding additional logic wiring insofar as possible to make use of existing unused logic elements in the circuitry to enable the PPI unit to receive and process the LAAS information in response to the Indicator Control C-8625/T identity code or all aircraft position selections to activate the LAAS functions for that particular PPI unit. The flashing target format alarm shall be activated when a low altitude alert is detected and shall continue to alarm for any associated target below minimum altitude. The LAAS visual (flashing lamp) and audible (horn or buzzer) alarms shall be separate and distinct from those Emergency, Hijack, and Communications Failure alarms provided with the AN/TPX-42A(V) system. An alarm generation circuit, separate from the alarm circuit existing in the PPI unit shall be provided to drive an external alarm unit, containing a visual (flashing lamp) and audible (horn or buzzer) for each PPI unit in the AN/TPXA(V) system. The visual alarm for that particular

PPI unit shall be activated when a low altitude alert is detected and shall continue to alarm while any target is below minimum altitude. The audible alarm shall be activated when a low altitude alert is detected, shall alarm for approximately 2 seconds, shall remain silent thereafter, and shall not alarm for approximately one second after all targets below minimum altitude are clear from that particular PPI unit. All new units, subchassis, modules, printed circuit board assemblies, and components provided to add to and modify the PPI unit and associated equipment to produce the LAAS functions shall meet the requirements of this specification and those documents referenced herein. The modification to the PPI unit to produce the LAAS functions shall not derogate the operational performance of the PPI unit and associated equipment.

3.6 Numeric Generation Conversion Equipment, FA-8953. The Numeric Generation Conversion Equipment, FA-8953, shall receive the LAAS information contained in bit 15 of the Altitude word transmitted from the IDP and shall process this LAAS information to provide the LAAS functions, consisting of the flashing target format and the visual (flashing lamp) and audible (horn or buzzer) alarms. The modification to the Numeric Generation Conversion Equipment, FA-8953, shall consist of adding additional logic wiring insofar as possible to make use of existing unused logic elements in the circuitry to enable the Numeric Generation Conversion Equipment, FA-8953, to receive and process the LAAS information in response to the Numeric Generation Conversion Indicator Control C-8625/T identity code or all aircraft position selections to activate the LAAS functions for that particular Numeric Generation Equipment. The LAAS visual (flashing lamp) and audible (horn or buzzer) alarms shall be separate and distinct from those Emergency, Hijack, and Communications Failure alarms provided with the AN/TPX-42A(V)4 system. An alarm generation circuit, separate from the alarm circuit existing in the Numeric Generation Conversion Equipment, shall be provided to drive an external alarm unit, containing the visual (flashing lamp) and audible (horn or buzzer) alarm for each Numeric Generation Conversion equipment in the AN/TPX-42A(V)4 system. The flashing target format and visual alarms shall be activated when the low altitude alert is detected and shall continue to alarm for any associated target below minimum altitude. The audible alarm shall be activated when a low altitude alert is detected, shall alarm for approximately 2 seconds, shall remain silent thereafter and shall not alarm for approximately one second after all targets below minimum altitude are clear from that particular Numeric Generation Conversion Equipment. All new units, subchassis, modules, printed circuit board assemblies, and components provided to add to and modify the Numeric Generation Conversion Equipment and associated display equipment to produce the LAAS functions shall meet the requirements of this specification and those documents referenced herein. The modification to the Numeric Generation Conversion Equipment to produce the LAAS functions shall not derogate the operational performance of the Numeric Generation Conversion equipment and associated display equipment.

3.7 Indicator Control C-8625/T. The modification shall enable the Indicator Control C-8625/T to control the activation of the LAAS functions in the display equipment, Indicator and BRITE/ Numeric, on the same identity code(s) or all aircraft position selective basis

as for the format display. The modification shall enable the Indicator Control C-8625/T to activate and display the LAAS functions consisting of visual (flashing lamp) and audible (horn or buzzer) alarms which are separate and distinct from the existing Emergency, Hijack and Communications Failure alarms. The LAAS visual and audible alarms shall be added to the Indicator Control C-8625/T for the PPI configuration. A separate alarm unit containing the LAAS visual and audible alarms shall be added to the BRITE/Numeric display for the BRITE/Numeric configuration. The LAAS visual (flashing lamp) alarm shall be labeled "LOW ALT".

3.8 Alarm unit. The modification shall provide a separate alarm unit to display and produce the LAAS visual and audible alarms. The visual (flashing lamp) and audible (horn or buzzer) alarms shall be separate and distinct from the existing Emergency, Hijack, and Communications Failure alarms in the AN/TPX-42A(V) system. The visual and audible alarms shall be activated and driven by the LAAS alarm generation circuit in the PPI unit and/or the Numeric Generation Conversion Equipment and shall meet the operational performance of the existing visual and audible alarm units and components in the AN/TPX-42A(V) system. The LAAS alarm unit shall be constructed with provisions for mounting with the BRITE/Numeric display unit or attached to the Indicator Control C-8625/T. The visual alarm indicator shall be red in color and shall be labeled "LOW ALT". The alarm unit shall be completely enclosed with front surface dimensions of 1-½ inches in height by 3 inches in width and a depth no greater than 6 inches and shall be capable of surface mounting.

3.9 Programming System. A system for programming the read only memory devices for the LAAS shall be furnished in accordance with the contract schedule. The programming system shall be provided with instructions on system use for programming the read only memory devices with the azimuth-range sector, minimum safe altitude, and beacon code inhibit data for a facility. The instructions shall include a program to enter the azimuth - range sector, minimum safe altitude data and beacon code inhibit data into the LAAS read only memory devices for a facility.

3.10 Inhibit code. The modification shall incorporate a means of enabling or inhibiting the LAAS for code 1200 and any single discrete or block code. The feature shall be incorporated in the system by means of a PROM. This feature shall not be selectable through front panel switches or system control units.

3.11 Reliability. The units, subunits, modules, printed circuit card assemblies, and components when operated in the system equipment to provide the LAAS functions indicated in this specification shall have a mean time between failures (MTBF) of not less than 4330 hours when operated at the specified service conditions (paragraph 3.2.2), where MTBF is defined by MIL-STD-781.

3.11.1 Reliability programs. The reliability requirements shall be accomplished through a reliability program plan in accordance with MIL-STD-785. The preliminary reliability program plan shall be submitted with the proposal and updated within 60 days after contract award.

3.11.2 Reliability prediction. The reliability prediction of the units, subunits, printed circuit card assemblies, and components added by the modification shall be made by the contractor using MIL-HDBK-217. Derating factors on all parts shall be verified in this prediction. Preliminary reliability predictions shall be submitted with the proposal and updated 60 days after award of contract.

3.11.3 Maintainability. All electronic and mechanical equipment and parts shall be designed and fabricated to minimize the skill, experience, and time necessary to assemble and maintain them. Corrective maintenance shall use a remove and replace philosophy with actual repair to the replacement module or printed circuit card assembly to be accomplished later in a separate maintenance area. Units, subunits, modules, printed circuit card assemblies, or components of the system shall be easily accessible without requiring removal of any other unit, subunit, module or printed circuit card. A preliminary maintainability program plan shall be submitted with the proposal and updated within 60 days after award of contract.

3.11.4 Useful life. The LAAS shall have a total operating life of 10 years minimum.

4. QUALITY ASSURANCE PROVISIONS.

4.1 General requirements for quality control, inspection, and tests. The contractor shall provide and maintain a quality control program in accordance with FAA-STD-013. The quality control, inspection, and test programs shall be in accordance with Section 1-4 of FAA-G-2100/1.

4.2 Design qualification tests. The following design qualification test shall be made under normal service conditions:

Indicator Data Processor (IDP)	Specification Paragraph
Data Storage and Comparator	3.3a., 3.3d., 3.3e., 3.3f., 3.3g., 3.3.1, 3.3.2, 3.3.3, 3.3.4, 3.3.5, 3.4, 3.4.1, 3.4.1.1, 3.4.1.2, 3.4.2, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10
Plan Position Indicator (PPI)	
Alarm Generation Unit	3.3b., 3.3d., 3.3e., 3.3f., 3.3g., 3.3.1, 3.3.2, 3.3.3, 3.3.4, 3.3.5, 3.5, 3.7, 3.8, 3.10
Indicator Control C-8625/T	3.3b., 3.3c., 3.3d., 3.3e., 3.3f., 3.3g., 3.3.5, 3.5, 3.7, 3.8, 3.10
Alarm Unit	3.3b., 3.3c., 3.3d., 3.3e., 3.3f., 3.3g., 3.3.1, 3.3.2, 3.3.3, 3.3.4, 3.3.5, 3.5, 3.7, 3.8, 3.10

BRITE/Numeric Generation Conversion

Alarm Generation Circuit Card Assembly	3.3c., 3.3d., 3.3e., 3.3f., 3.3g., 3.3.1, 3.3.2, 3.3.3, 3.3.4, 3.3.5, 3.6, 3.7, 3.8, 3.10
BRITE/ Numeric Circuit Card Assembly A1A1	3.3c., 3.3d., 3.3e., 3.3f., 3.3g., 3.3.1 3.3.2, 3.3.3, 3.3.4, 3.3.5, 3.6, 3.7, 3.8, 3.10
Alarm Unit	3.3b., 3.3c., 3.3d., 3.3e., 3.3f., 3.3g., 3.3.1, 3.3.2, 3.3.3, 3.3.4, 3.3.5, 3.6, 3.7, 3.8, 3.10
Indicator Control	3.3b., 3.3c., 3.3d., 3.3e., 3.3f., 3.3g., 3.3.5, 3.6, 3.7, 3.8, 3.10

4.2.1 Reliability/Maintainability demonstration. The reliability requirements of paragraph 3.11 shall be demonstrated in accordance with Test Level A-1 test Plan IV of MIL-STD-781. The maintainability demonstration shall be in accordance with MIL-STD-471, Method I-B.

4.2.1.1 Reliability/Maintainability demonstration test plan. The contractor shall submit for approval to the contracting officer reliability/maintainability demonstration test plans which conform to the detailed requirements of paragraphs 4.2 of MIL-STD-781 and MIL-STD-471 and the requirements of this specification. The reliability/maintainability test plans shall be submitted sixty (60) days prior to start of testing and shall be approved prior to conducting the tests.

4.3 Type tests. The following tests shall be made while subjecting the equipment to the type test procedure described under paragraph 1-4.3.3.2 of FAA-G-2100/1.

Indicator Data Processor (IDP)	Specification Paragraph
Data Storage and Comparator Modules	3.3a., 3.3d., 3.3.e., 3.3f., 3.3g., 3.4, 3.4.1, 3.4.1.1, 3.4.1.2, 3.4.2, 3.5, 3.6, 3.7 3.8. 3.9, 3.10
Plan Position Indicator (PPI)	
Alarm Generation Circuit Card Assembly	3.3b., 3.3d., 3.3e., 3.3f., 3.3g., 3.5, 3.7, 3.8, 3.10
Indicator Control C-8625/T	3.3b., 3.3c., 3.3d., 3.3e., 3.3f., 3.5, 3.7, 3.8, 3.10
Alarm Unit	3.3b., 3.3c., 3.3d., 3.3e., 3.3f., 3.3g., 3.5, 3.7, 3.8, 3.10

BRITE/ Numeric Generation Conversion

Alarm Generation Circuit Card Assembly	3.3c., 3.3d., 3.3e., 3.3f., 3.3g., 3.6, 3.7, 3.8, 3.10
BRITE/Numeric Circuit Card Assembly A1A1	3.3c., 3.3d., 3.3e., 3.3f., 3.3g., 3.6, 3.7, 3.8, 3.10
Alarm Unit	3.3b., 3.3c., 3.3d., 3.3e., 3.3f., 3.3g., 3.6, 3.7, 3.8, 3.10
Indicator Control C-8625/T	3.3b., 3.3c., 3.3d., 3.3e., 3.3f., 3.3g., 3.6, 3.7, 3.8, 3.10

4.4 Production tests. The following production tests shall be performed under normal test conditions:

Indicator Data Processor (IDP)	Specification Paragraph
Data Storage and Comparator Modules	3.3a., 3.3d., 3.3e., 3.3f., 3.3g., 3.4, 3.4.1, 3.4.2, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10

Plan Position Indicator (PPI)

Alarm Generation Circuit Card Assembly	3.3b., 3.3d., 3.3e., 3.3f., 3.3g., 3.5, 3.7, 3.8, 3.10
Indicator Control C-8625/T	3.3b., 3.3d., 3.3e., 3.3f., 3.3g., 3.5, 3.7, 3.8, 3.10
Alarm Unit	3.3b., 3.3d., 3.3e., 3.3f. 3.3g., 3.5, 3.7, 3.8, 3.10

BRITE/Numeric Generation Conversion

Alarm Generator Circuit Card Assembly	3.3c., 3.3d., 3.3e., 3.3f., 3.3g., 3.6, 3.7, 3.8, 3.10
BRITE/Numeric Circuit Card Assembly A1A1	3.3c., 3.3d., 3.3e., 3.3f., 3.3g., 3.6, 3.7, 3.8, 3.10
Alarm Unit	3.3c., 3.3d., 3.3e., 3.3f., 3.3g., 3.6, 3.7, 3.8, 3.10
Indicator Control C-8625/T	3.3c., 3.3d., 3.3e., 3.3f., 3.3g., 3.6, 3.7, 3.8, 3.10

5. PREPARATION FOR DELIVERY

5.1 Packing. The equipment shall be prepared for delivery in accordance with specification MIL-E-17555.

6.NOTES

6.1 Note on information items. The contents of the subparagraphs below are only for the information of the initiator of the procurement requests and are not a part of the requirements of this specification. They are not contract requirements, nor binding on either the Government or the contractor. In order for these terms to become a part of a resulting contract, they must be specifically incorporated in the schedule of the contract. Any reliance placed by the contractor on the information in these subparagraphs is wholly at the contractor's own risk.

6.1.1 Programming memory devices. The contract schedule should include the fact that the Government will furnish the range-azimuth-altitude sector and beacon code inhibit data from each facility to the contractor for programming the read only memory devices in the LAAS to the minimum safe altitude map and inhibit codes of the facility for the initial acceptable modification of the system. The contract schedule should also include the requirement for the development of a computer program to generate the programmable read only memories (PROM) programs and of a semi-automatic PROM program to load the memories to be used by the Government to meet future changes in the LAAS. The contract schedule should include the requirement that unprogrammed PROMS shall be provided for designated facilities.

6.1.2 Provisioning documentation. The contract schedule should include the requirement that provisioning documentation should be furnished in accordance with FAA specification FAA-G-1210C, Provisioning Documentation.

6.1.3 Spare parts peculiar. The contract schedule should include the requirement that spare parts peculiar shall be furnished in accordance with FAA specification FAA-G-1375a, Spare Parts Peculiar for Electronic, Electrical, and Mechanical Equipments.

6.1.4 Programming system. The contract schedule should include the requirement that a programming system for programming the LAAS shall be furnished to the Government in accordance with the requirements of this specification.

a. The following equipment would be required for programming the LAAS:

(1) Data General, computer and memory (NOVA3), to program the LAAS PROMs.

(2) TI Silent 700, Twin Cassette, data terminal, for use as a data entry device.

(3) Prelog PROM Burner, or equivalent, semiautomatic universal PROM burner to be driven as a peripheral device by the computer.

(4) Interfaces, cabling, and controls required to install and operate the LAAS programming system.

(5) A supply of PROMs to meet operational needs.

b. The following software would be required to program the LAAS and to technically support the programming system:

(1) The contractor's operational software used to program the read only memory devices in the LAAS.

(2) Data General and contractor developed diagnostic software and commercial documentation.

c. The programming system comprised of the above equipment and software would be furnished to the Government at the completion of the LAAS production run.

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Table of Contents

TABLE OF CONTENTS